

Marked-up Set of Claims (According to 37 CFR 1.173(b)(2))

1. (Ten times amended) A method for dewatering biological sludge [that has been digested by]from a thermophilic digestion process, comprising:

a. adding a polymeric quaternary ammonium compound[s], as primary component, to the biological sludge; and

b. adding [polyacrylamide]to the biological sludge a cationic polyacrylamide or separate from the polymeric quaternary ammonium compound adding an anionic polyacrylamide;

such that [any combinations of] the polymeric quaternary ammonium compound[s] and [of]the polyacrylamide[s] enhance dewatering of the sludge.

2. (Nine times amended) The method for dewatering biological sludge according to claim 1, wherein [the]said polymeric quaternary ammonium compound[s] is[are from] poly(di-allyl di-methyl ammonium chloride (DADMAC))[family].

3. (Ten times amended) The method for dewatering biological sludge according to claim 1, wherein [the]said polymeric quaternary ammonium compound[s] is[are from] poly(epichlorohydrin di-methyl amine (epi-DMA))[family].

4. (Four times amended) The method for dewatering biological sludge according to claim 1, wherein [the]said polymeric quaternary ammonium compound is added directly to the sludge; and _____

_____, [, upon]following the formation of microflocs of the sludge from addition of the polymeric quaternary ammonium compound, [a]said cationic polyacrylamide is added[to form a floc that dewateres the sludge].

5. (Four times amended) The method for dewatering biological sludge according to claim 4, wherein [the]said polymeric quaternary ammonium compound and [the]said cationic polyacrylamide are in an approximate[ly] 1:1 ratio, with [the]said cationic polyacrylamide having a higher molecular weight than the polymeric quaternary ammonium compound[does].

6. (Four times amended) The method for dewatering biological sludge according to claim 4, wherein the ratio[s] of [the]said polymeric quaternary ammonium compound with respect to [the]said cationic polyacrylamide range from about 1:10 to about 20:1.

7. (Twice amended) The method for dewatering biological sludge according to claim 4, wherein the polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between about 50 ppm:1 percent and about 300 ppm:1 percent.

8. (Three times amended) The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound is added directly to the sludge[, in an amount sufficient to cause formation of a cationic overcharge within a developed microfloc system], and wherein

said polyacrylamide is[and an] anionic[polyacrylamide is then added for final floc formation].

9. (Cancelled)

10. (Four times amended) The method for dewatering biological sludge according to claim 8, wherein [the]said polymeric quaternary ammonium compound and [the]said anionic polyacrylamide are in an approximate[ly] 10:1 ratio, with [the]said anionic polyacrylamide having a higher molecular weight than the polymeric quaternary ammonium compound[does].

11. (Amended) The method for dewatering biological sludge according to claim 10, wherein [the]said anionic polyacrylamide is about 40% anionic.

12. (Four times amended) The method for dewatering biological sludge according to claim 8, wherein the ratio[s] of [the]said polymeric quaternary ammonium compound to [the]said anionic polyacrylamide ranges from about 1:10 to about 20:1.

13. (Three times amended) The method for dewatering biological sludge according to claim 8, wherein the polymer concentration to solids ratio of total polymer dosage requirement in

relationship to percentage of solids component of the sludge is between approximately 50 ppm:1 percent and approximately 300 ppm:1 percent.

14. (Original) The method for dewatering biological sludge according to claim 1, wherein the biological sludge is mixed with primary sludge.

15. (Ten times amended) [A composition]The method for dewatering biological sludge according to claim 1, [comprising] wherein
said polymeric quaternary ammonium compound[s, as primary component, and]
is added along with said cationic polyacrylamide[, said components being present in the
composition in a ratio to enable the composition to function as an agent for dewatering
biological sludge from a thermophilic digestion process].

16. (Eight times amended) The method for dewatering biological sludge according to claim 1, wherein [the]said cationic or anionic polyacrylamide and [the]said polymeric quaternary ammonium compound[s are]is [used]added in solution [or in dry] form.

17 – 21. (Canceled)

22. (Three times amended) A method for dewatering a sludge comprising water and solids, wherein the solids comprise thermophiles, the method comprising:
contacting the sludge according to a technique selected from a group of
techniques including:
contacting the sludge with a polymeric quaternary ammonium compound along
with a cationic polyacrylamide; and
contacting the sludge first with a polymeric quaternary ammonium compound
and then with a cationic polyacrylamide;
to form a floc.

23. (Cancelled)

24. (Four times amended) The method of claim 22, wherein said polymeric quaternary ammonium compound comprises a molecular weight in the range of about 500,000 to about 3,000,000 and said cationic polyacrylamide comprises a molecular weight in the range of about 5,000,000 to about 16,000,000.

25. (Twice amended) The method of claim 22, wherein said polymeric quaternary ammonium compound is added in an amount sufficient to form microflocs of said thermophiles; and wherein
said cationic polyacrylamide is added in an amount sufficient to agglomerate the microflocs into flocs for dewatering.

26. (Five times amended) The method of claim 22, wherein said polymeric quaternary ammonium compound comprises at least one compound selected from the group consisting of poly(di-allyl di-methyl ammonium chloride) and poly(epichlorohydrin di-methyl amine).

27. (Twice amended) The method of claim 25, wherein the ratio of said polymeric quaternary ammonium compound to said cationic polyacrylamide is in the range of about 1:10 to about 20:1.

28. (Three times amended) The method of claim 25, wherein the concentration of said polymeric quaternary ammonium compound and said cationic polyacrylamide to the percentage of solids in said sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

29 – 32. (Canceled)

33. (Twice amended) A method for dewatering a sludge comprising water and thermophiles, the method comprising:
adding to the sludge a polymeric quaternary ammonium compound.

34. (Canceled)

35. (Three times amended) The method of claim 33, wherein said polymeric quaternary ammonium compound is added in an amount sufficient to form microflocs of the thermophiles.

36. (Five times amended) The method of claim 35, wherein said polymeric quaternary ammonium compound comprises at least one compound selected from the group consisting of poly(di-allyl di-methyl ammonium chloride) and poly(epichlorohydrin di-methyl amine).

37. (Three times amended) The method of claim 35, wherein the concentration of said polymeric quaternary ammonium compound to the percentage of solids in said sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

38. (Five times amended) The method of claim 35, further comprising the addition of an anionic polyacrylamide for final floc formation.

39. (Cancelled)

40. (Three times amended) The method of claim 38, wherein the concentration of said polymeric quaternary ammonium compound to the percentage of solids in said sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

41. (Three times amended) A sludge composition comprising:

water;

polyacrylamide comprising a cationic or an anionic moiety;

a polymeric quaternary ammonium compound; and

solids comprising thermophiles.

42 – 43. (Cancelled)

44. (Five times amended) The sludge composition of claim 41, wherein said polymeric quaternary ammonium compound comprises at least one compound selected from the group consisting of poly(di-allyl di-methyl ammonium chloride) and poly(epichlorohydrin di-methyl amine).

45. (Three times amended) The sludge composition of claim 41, wherein the ratio of said polymeric quaternary ammonium compound to said polyacrylamide is in the range of about 1:10 to about 20:1.

46. (Three times amended) The sludge composition of claim 41, wherein the concentration of said polymeric quaternary ammonium compound and said polyacrylamide to the percentage of solids in said sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

47. (Five times amended) The sludge composition of claim 41, wherein said polymeric quaternary ammonium compound comprises a molecular weight in the range of about 500,000 to about 3,000,000; wherein

said polyacrylamide comprises a cationic moiety having a molecular weight in the range of about 5,000,000 to about 16,000,000; or wherein

said polyacrylamide comprises an anionic moiety having a molecular weight in the range of about 5,000,000 to about 15,000,000.

48. (Four times amended) A sludge composition comprising:
water;
polyacrylamide comprising a cationic or an anionic moiety;
a polymeric quaternary ammonium compound; and
solids comprising flocs of thermophiles.

49 – 50. (Cancelled)

51. (Five times amended) The sludge composition of claim 48, wherein said polymeric quaternary ammonium compound comprises at least one compound selected from the group consisting of poly(di-allyl di-methyl ammonium chloride) and poly(epichlorohydrin di-methyl amine).

52. (Three times amended) The sludge composition of claim 48, wherein the ratio of said polymeric quaternary ammonium compound to said polyacrylamide is in the range of about 1:10 to about 20:1.

53. (Three times amended) The sludge composition of claim 48, wherein the concentration of said polymeric quaternary ammonium compound and said polyacrylamide to the percentage of solids in said sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

54. (Five times amended) The sludge composition of claim 48, wherein said polymeric quaternary ammonium compound comprises a molecular weight in the range of about 500,000 to about 3,000,000, wherein

said polyacrylamide comprises a cationic moiety having a molecular weight in the range of about 5,000,000 to about 16,000,000; or wherein

said polyacrylamide comprises an anionic moiety having a molecular weight in the range of about 5,000,000 to about 15,000,000.

55. (Four times amended) A sludge composition comprising:
water;
a polymeric quaternary ammonium compound; and
solids comprising thermophiles.

56 – 57. (Cancelled)

58. (Five times amended) The sludge composition of claim 55, wherein said polymeric quaternary ammonium compound comprises at least one compound selected from the group consisting of poly(di-allyl di-methyl ammonium chloride) and poly(epichlorohydrin di-methyl amine).

59 – 66. (Cancelled)

67. (Amended) A sludge composition comprising:

water;

thermophiles; and

a polymeric quaternary ammonium compound.

68. (Five times amended) The sludge composition of claim 67, wherein said polymeric quaternary ammonium compound comprises at least one compound selected from the group consisting of poly(di-allyl di-methyl ammonium chloride) and poly(epichlorohydrin di-methyl amine).

69. (Twice amended) The sludge composition of claim 67, wherein said polymeric quaternary ammonium compound is present in an amount sufficient to form microflocs of said thermophiles.

70. (Three times amended) The sludge composition of claim 67, further comprising a cationic or an anionic polyacrylamide.

71 – 72. (Canceled)

73. (Amended) The method of claim 33, wherein a cationic polyacrylamide is added.

74 – 79. (Canceled)